QUESTION 3: WHAT IS THE UTILITY OF THE GLYCEMIC INDEX/GLYCEMIC LOAD FOR PROVIDING DIETARY GUIDANCE FOR AMERICANS?

Conclusion

Current evidence suggests that the glycemic index and/or glycemic load are of little utility for providing dietary guidance for Americans.

Rationale

Overview. The *glycemic index* is a classification proposed to quantify the relative blood glucose response to consuming carbohydrate-containing foods. Operationally, it is the area under the curve for the increase in blood glucose after the ingestion of a set amount of carbohydrate in a food (e.g., 50 g) during the 2-hour postprandial period, relative to the same amount of carbohydrate from a reference food (white bread or glucose) tested in the same individual under the same conditions and using the initial blood glucose concentration as a baseline.

The ***glycemic load*** is an indicator of the glucose response or insulin demand that is induced by total carbohydrate intake. It is calculated by multiplying the weighted mean of the dietary glycemic index of the diet of an individual by the percentage of total energy from carbohydrate.

The ***glycemic response*** is defined as the effects that carbohydrate-containing foods have on blood glucose concentration during the time course of digestion.

Review of the Evidence Glycemic Index. Although the use of food with a low-glycemic index may reduce postprandial glucose, there is not sufficient evidence of long-term benefit to recommend general use of diets that have a low-glycemic index.

Glycemic Load. The glycemic load has been used primarily in observational epidemiological studies to examine the effect of diet on the risk of developing chronic diseases such

as diabetes, heart disease, and cancer (IOM, 2002). The glycemic load has been reported to be positively associated with the risk of developing type 2 diabetes in men and women (Salmeron et al., 1997a, 1997b). In a cross-sectional study of healthy postmenopausal women, dietary glycemic load was inversely related to plasma high-density lipoprotein (HDL) cholesterol and positively related to fasting triglycerides (Liu et al., 2001). In the analysis of the NHANES III results, a high glycemic load was associated with a lower concentration of plasma HDL cholesterol (Ford and Liu, 2001).

The findings from epidemiological studies indicate a possible relationship between the propensity of diets with a high glycemic load to raise blood glucose levels and increase in the risk of type 2 diabetes. To determine the utility of glycemic load in predicting risk, long-term trials are needed in which diets with high glycemic load are compared to low glycemic load diets with regard to outcomes. Also, it is necessary to examine the effect of glycemic load of a mixed meal diet on postprandial glucose and insulin levels. A 4-week study by Wolever and Mehling (2003) comparing high-and low-glycemic index diets in impaired glucose tolerance subjects showed the high-glycemic index diet to have no significant change in glucose, but a lower insulin level than the low-glycemic diet.

Relationship of Glycemic Index and Load. The relationship of glycemic index and load has been examined in long-term prospective studies. These have shown inconsistent results. A followup study within the *Nurses' Health Study* confirmed the association between glycemic load and risk of type 2 diabetes. However, the *Iowa Women's Health Study* showed no significant relationship between glycemic index or load and the development of diabetes (Meyer et al., 2000).

The inconsistencies among studies are likely due to the poor tools available to measure these dietary components. Food frequency questionnaires can be extremely inaccurate, even in the best of hands. In addition, the food frequency

questionnaires used in these studies were not designed to measure glycemic index or load. The validation data are weak. Prospective, randomized studies are needed to answer this question. The relationship between glycemic index and glycemic load and the development of type 2 diabetes is unclear at this time.